Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

GEOMETRY.

412. Proposed by S. LEFSCHETZ, The University of Nebraska.

To inscribe in a given circle an isosceles triangle in which the base plus the altitude is equal to a given length.

413. Proposed by D. F. KELLY, New York City.

To construct a triangle, having given the base, vertical angle and the ratio of the altitude to the difference of the other two sides.

414. Proposed by H. C. FEEMSTER, York, Neb.

To construct the cyclic quadrilateral, having given its four sides.

CALCULUS.

334. Proposed by ELMER SCHUYLER, Brooklyn, N. Y.

Solve the differential equation:

$$\frac{\partial^2 T}{\partial u \partial v} + \frac{2v}{u^2 + v^2 + 1} \frac{\partial T}{\partial u} + \frac{2u}{u^2 + v^2 + 1} \frac{\partial T}{\partial v} = 0.$$

335. Proposed by W. R. LEBOLD, Cambridge, Ohio.

Let $\rho = F(\theta, \phi)$ be the equation in polar coordinates of a closed surface. Show that the volume of the solid bounded by the surface is equal to the double integral.

$$\tfrac{1}{3} \int\int \rho \cos \gamma \, d\sigma$$

extended over the whole surface, where $d\sigma$ represents the element of area, and γ the angle which the radius vector makes with the exterior normal.

[Goursat-Hedrick, *Analysis*, p. 325, ex. 9.]

336. Proposed by EVA S. MAGLOTT, Ada, Ohio.

If a right cone stands on an ellipse, prove that its superficial area is

$$\frac{\pi}{2}(OA + OA')(OA \cdot OA')^{\frac{1}{2}} \sin \alpha,$$

where O is the vertex of the cone, A and A' the extremities of the major axis of the ellipse, and α is the semi-angle of the cone.

MECHANICS.

271. Proposed by B. F. FINKEL, Springfield, Mo.

A hollow spherical shell is filled with a frictionless fluid and rolls down a rough inclined plane. After rolling t seconds, the fluid suddenly solidifies. Determine the subsequent motion of the spherical shell.

272. Proposed by J. F. LAWRENCE, Stillwater, Okla.

A perfectly rough circular cylinder is fixed with its axis horizontal. A sphere is placed on it in a position of unstable equilibrium, and projected with a given velocity parallel to the axis of the cylinder. If the sphere be slightly disturbed in a horizontal direction perpendicular to the direction of the axis of the cylinder, determine at what point the sphere will leave the cylinder.

273. Proposed by F. P. MATZ, Reading, Pa.

A person is placed on a perfectly smooth surface. How may he get off?

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

187. Proposed by E. T. BELL ,New York, N. Y.

If m is any integer, P the product of all the distinct prime factors of m and λ their number, and if $N(x)$ denote the number of divisors of x, then

$$6^\lambda \Sigma N(d) \cdot N\left(\frac{m}{d}\right) = N(m) \cdot N(Pm) \cdot N(P^2m),$$

where the sign of summation extends to all divisors of m.

188. Proposed by ELMER SCHUYLER, Brooklyn, New York.

Solve the congruence, $3x^2 + 4x + 5 \equiv 0$, mod. 20 [Reid].

189. Proposed by V. M. SPUNAR, Chicago, Ill.

If p and $p_1 = 2^p - 1$ are primes, then are the numbers of the sequence, $p_1 = 2^p - 1$, $p_2 = 2^{p_1} - 1$, $p_3 = 2^{p_2} - 1$, $\cdots$, $p_n = 2^{p_{n-1}} - 1$ all primes?

SOLUTIONS OF PROBLEMS.

ALGEBRA.

379. Proposed by C. N. SCHMALL, New York, N. Y.

Given $y = ax + b$. If the values of x increase in an arithmetical progression, show that the values of y vary likewise.

SOLUTION BY T. M. BLAKSLEE, Ames, Iowa.

We have

$$y_1 = ax_1 + b, \quad y_2 = ax_2 + b, \quad y_3 = ax_3 + b, \cdots.$$

Hence,

$$y_2 - y_1 = a(x_2 - x_1), \quad y_3 - y_2 = a(x_3 - x_2), \cdots.$$

Since $x_1, x_2, x_3, \cdots, x_n$ are in an arithmetical progression,

$$x_2 - x_1 = x_3 - x_2 = x_4 - x_3, \cdots, = d \text{ say.}$$

Hence,

$$y_2 - y_1 = y_3 - y_2 = y_4 - y_3, \cdots, = ad.$$

Hence,

$$y_2 = y_1 + ad, \quad y_3 = y_2 + ad = y_1 + 2ad,$$

$$y_4 = y_3 + ad = y_1 + 3ad, \cdots, y_n = y_1 + (n-1)ad,$$

an arithmetical progression whose common difference is ad.

Also solved by A. H. Holmes, A. M. Hardin, Elmer Schuyler, W. T. Risley, T. J. Fitzpatrick, and the Proposer.

380. Proposed by J. K. ELWOOD, Lucas, Kansas.

A and B set out to walk around a cinder path a mile in circumference, and walk 3 hours, A walking 8 miles farther than B. Each reduced his rate one mile per hour at the end of the first hour, and again one mile per hour at the end of the second hour, his speed being otherwise uniform. They start in the same direction, but 12 minutes after A has passed B the third time he turns and walks in the other direction until 6 minutes after he has met B the third time, when he returns to his original direction, and overtakes B four times more. Determine their initial velocities.

SOLUTION BY THE PROPOSER.

A gains $2\frac{2}{3}$ miles an hour, or one mile in 22.5 minutes. He overtakes and passes B the first three times in 67.5 minutes, and the last three times in 67.5 minutes. All of A's travel requiring calculation, therefore, occurs in

$$180 - (67.5 + 67.5) = 45 \text{ minutes of the second hour.}$$